

Requested Patent GB257127A

Title: IMPROVEMENTS IN AND RELATING TO REFRACTOMETERS ;

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Inventor(s) ;

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ABSTRACT:

# PATENT SPECIFICATION



Application Date : Oct. 30, 1925. No. 27,345 / 25. **257,127**

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## PROVISIONAL SPECIFICATION.

### Improvements in and relating to Refractometers.

We, BRISTOW JOHN TULLY, of 19, Albert Road, Regent's Park, in the Borough of St. Pancras, London, a British subject, and THE RAYNER OPTICAL COMPANY LIMITED, of 9, Vere Street, Cavendish Square, in the Borough of St. Marylebone, London, a British company, do hereby declare the nature of this invention to be as follows:—

10 The invention relates to improvements in refractometers for obtaining the refractive index of various substances, such for example as precious stones, and it has for its objects a device which will  
15 give a long optical system by means of which improved definition and larger scale readings are obtainable and a device which is more convenient in use.

To attain this end the device comprises  
20 a hemisphere of glass of high refractive index upon which the substance under examination is placed, an optical system comprising a lens system, a right angle prism, a second lens system, a second  
25 prism, a third lens system, a transparent scale and a lens system mounted in an adjustable eye-piece.

In carrying out this invention according to one embodiment thereof, the two  
30 prisms and the second and third lens systems are located within a suitable casing. the eye-piece is carried by the inclined top face thereof and the hemisphere and first lens system are contained in a small  
35 box like structure arranged on the rear face of the casing. A suitable handle is provided on the front of the casing.

The hemisphere which is of glass having a known refractive index is cemented  
40 with its flat face uppermost into a metal disc rotatably mounted in the upper face

of the box like structure the outer rim of said disc being preferably milled and of such a diameter that the sides extend beyond the side walls of the box so that it may be rotated as desired. The hemisphere is preferably provided with a vertically arranged yielding support of any suitable form. To prevent light entering the first lens system through the top of the hemisphere a suitably arranged hood is hinged to the top rear edge of the box and a further member, adapted to support a light diffusing plate of matt-opal or the like, is hinged to the bottom rear edge of said box which is provided with an aperture through which light is directed to the hemisphere and through said hemisphere to the under-surface of the substance under examination.

The first lens system is mounted in a suitable support carried by the rear wall of the main casing and the first prism is located within said casing with one of its sides disposed at right angles to the principal axis of the lens and its other side parallel thereto so that the rays are deflected downwardly. For the purpose of enabling hemispheres of slightly varying refractive indices to be employed the prism is preferably mounted on trunnions so that it may be adjusted relatively to the principal axis of the lens, suitable means being provided for maintaining the prism at the desired angle.

The principal axis of the second lens system is arranged at right angles to the principal axis of the first lens system and the principal axis of the third lens system is parallel thereto and coincident with the principal axis of the lens system of the eye-piece and the transparent

scale is located at the base of the lens system of the eye-piece.

By means of this device it is possible to place said device on the table or other support and to have both hands free to manipulate said device and the stone or other substance under examination on the hemisphere, or the disc carrying said

hemisphere while keeping the eye in close proximity to the eye-piece.

Dated this 30th day of October, 1925.

PHILLIPSS,

Chartered Patent Agents,  
70, Chancery Lane, London, W.C. 2,  
For the Applicants.

## COMPLETE SPECIFICATION.

### Improvements in and relating to Refractometers.

We, BRISTOW JOHN TULLY, of 19, Albert Road, Regent's Park, in the Borough of St. Pancras, London, a British subject, and THE RAYNER OPTICAL COMPANY LIMITED, of 9, Vere Street, Cavendish Square, in the Borough of St. Marylebone, London, a British company, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The invention relates to improvements in refractometers for obtaining the refractive index of various substances, such for example as precious stones, and it has for its objects a device which will give a long optical system by means of which improved definition and larger scale readings are obtainable and a device which is more convenient in use.

To attain this and the device comprises a hemisphere of glass of high refractive index upon which the substance under examination is placed, an optical system comprising a lens system, a right angle prism, a second lens system, a second prism, a third lens system, a transparent scale and a lens system mounted in an adjustable eye-piece.

In carrying out this invention according to one embodiment thereof, the two prisms and the second and third lens systems are located within a suitable casing, the eye-piece is carried by the inclined top face thereof and the hemisphere and first lens system are contained in a small box like structure arranged on the rear face of the casing. A suitable handle is provided on the front of the casing.

In the accompanying drawing which illustrates this invention:—

Figure 1 is a side elevation.

Figure 2 a plan, and

Figure 3 a sectional side elevation on line 3—3 of Figure 2.

In the drawings 1 is the hemisphere of glass having a known refractive index said hemisphere being cemented with its

flat face uppermost into a metal disc 2 rotatably mounted in the upper face of a box like structure 3, the outer rim of the disc 2 being preferably milled and of such a diameter that the sides extend beyond the side walls of the box 3, as shown in Figure 2, so that it may be rotated as desired. The hemisphere 1 is preferably provided with a vertically arranged support 4 secured in a socket 5 adjustably mounted in the lower wall of the part 3. The upper end of the support 4 is preferably provided with a thin piece of yielding material 6 such as cloth so as to prevent any abrasive action on the part 1. To prevent light entering the first lens system 7 through the top of the hemisphere 1 a suitably arranged hood 8 is hinged to the top rear edge of the part 3, and a further member 9, adapted to support a light diffusing plate 10 of matt-opal or the like, is hinged to the bottom rear edge of the part 3 which is provided with an aperture 11 through which light is directed to the hemisphere 1 and through said hemisphere to the undersurface of the substance under examination. The member 9 is supported at the required angle by means of a hooked part 9<sup>a</sup> pivoted on the member 9, the hooked end of said part engaging with a stud or like part 9<sup>b</sup> provided on the part 3.

The first lens system 7 is mounted in a suitable support carried by the rear wall 12 of the main casing and the two prisms 13 and 14 and second and third lens systems 15 and 16 respectively are mounted in a part 17 secured to the rear wall 12 and top wall 18.

The prism 13 is arranged so that the light rays, projected through the lens system 7, are deflected downwardly. For the purpose of enabling hemispheres of slightly varying refractive indices to be employed the prism 13 is preferably arranged in a casing 19 mounted on trunnions 20 so that it may be adjusted relatively to the principal axis of the lens 7 the means for effecting said adjustment and for maintaining the prism at the

desired angle comprising a set screw 21 and a spring pressed stud 22.

The principal axis of the second lens system 15 is arranged at right angles to the principal axis of the first lens system 7 and the principal axis of the third lens system 16 is parallel thereto and coincident with the principal axis of the lens system of the eye piece 23. The prism 14 is located as shown with its longest side arranged at right angles to the axes of the lens systems 15 and 16.

A transparent scale 24 graduated directly into refractive indices is located at the base of the lens system of the eye piece 23.

The main casing is furnished on its front wall with a handle 25 formed in one with the casing or attached thereto in any convenient manner.

By means of this device it is possible to place said device on a table or other support and to have both hands free to manipulate said device and the stone or other substance under examination on the hemisphere or the disc carrying said hemisphere while keeping the eye in close proximity to the eye piece.

In use, the upper surface of the hemisphere must be freed from dust and the largest flat surface of the test object is carefully cleaned. A drop of contact fluid, such as methylene iodide in which sulphur has been dissolved is applied to the central surface of the hemisphere. The cleaned flat surface of the test object is then placed on the hemisphere and in the fluid and pressed very lightly into contact. The member 8 is then brought

down as close to the test object as possible without exerting pressure thereon. The member 9 is then positioned to illuminate the under side of the hemisphere, or if a monochromatic beam of light is to be used the member 9 is swung from position and the direct beam from the monochromatic source employed.

The contact fluid mentioned above has a refractive index of 1.78 and upon looking into the eye piece there will be seen a boundary line between light and shadow at the reading 1.78. If the test object has a refractive index below this figure there will be another boundary line at the refractive index for the object.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A refractometer for taking readings of the refractive index of gem stones and the like comprising a casing in which are mounted a hemisphere of glass of high refractive index and a plurality of prisms and lens systems arranged so as to give a long optical system by means of which improved definition and larger scale readings are obtainable.

2. A refractometer for obtaining the refractive index of various substances constructed and arranged substantially as described and illustrated in the accompanying drawings.

Dated this 30th day of July, 1926.

PHILLIPSS.

[This Drawing is a reproduction of the Original on a reduced scale.]

